



Management of Arterial Injuries Associated With Fractures and Dislocations

Background and justification

Arterial injuries to the extremities are rare and present a diagnostic and management challenge if limb salvage is to be successful. In civilian practice, fast and accurate diagnosis is of paramount importance. There should be immediate referral to a surgeon with the skills to perform vascular repair. A low threshold for early surgical intervention is important for successful salvage. The responsibility for managing these cases lies jointly with the orthopaedic surgeon and the team managing the vascular injury.

Inclusions

Patients of all ages with vascular injuries to the extremity.

Standards for Practice

1. Resuscitation and management of all life threatening injuries must take priority over any extremity problems.
2. Active extremity haemorrhage must be controlled immediately by direct pressure or tourniquet. Blind clamping in wounds is discouraged and potentially detrimental.
3. Neurovascular injury should be assumed in all injured extremities until definitively excluded; this is a diagnostic priority. The findings of neurovascular examination must be documented as a timed entry in the medical records.
4. The pulseless, deformed limb should be re-aligned and any dislocations reduced under appropriate sedation or anaesthesia. The limb should be splinted, the neurovascular examination repeated and documented and appropriate radiological imaging obtained. In many cases, the circulation will be restored.
5. The clinical signs of vascular injury may be difficult to identify. Key signs include altered sensation, expanding haematoma and absent pulse(s). The pink, pulseless limb must be assumed to have an arterial injury until proven otherwise. Capillary return can be misleading due to pooling of blood in the extremity.
6. A devascularised limb requires urgent surgical exploration; this should only be delayed to treat life-threatening injuries.
7. Some injuries will not be salvageable; patients must be made aware that there is a high risk of amputation. A decision to perform early amputation should be made by two consultants.
8. All Trauma Units and Major Trauma Centres must have a clear emergency referral protocol to the appropriate vascular surgical team (plastic, vascular, general, or hand surgery). Consultants in orthopaedics and from the appropriate vascular team must be involved from the time of diagnosis.
9. The limb must be revascularised as a surgical emergency. Beyond 3-4 hours, warm ischaemia results in irreversible tissue damage and an increasing risk of amputation. Risks of delayed revascularisation include myoglobinuria and may be associated with increased mortality. Access incisions should be planned to facilitate subsequent soft tissue coverage of open fractures.
10. Imaging modalities include duplex, angiography, CT angiogram and on-table angiogram. Access to these must not significantly delay reperfusion surgery and the injury pattern usually predicts the level.
11. The sequence of surgical interventions can be crucial. In general, vascular perfusion should be restored using temporary shunts followed by assessment of viability. Skeletal stabilisation should then be performed, followed by definitive reconstruction with autologous vein grafts.
12. Any peripheral nerve injury identified at the time of surgery should be carefully documented and the patient referred early to the appropriate specialist. If the expertise is available, ideally peripheral nerves should be repaired.
13. The risk of compartment syndrome is high following reperfusion and there should be a low threshold for performing fasciotomies. The incisions should aim to preserve perforating vessels.
14. Post-operative care should be provided in an appropriate area with nursing and medical staff competent in the assessment of the critically injured limb.

Evidence base

Studies with level-1 evidence are lacking. Predominantly retrospective series, with some good prospective studies, meta-analyses and reviews.